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MULTI-AGENCY RADIATION SURVEY AND SITE INVESTIGATION MANUAL (MARSSIM)
WORKGROUP MEETING NOTES - DRAFT

MONDAY, SEPTEMBER 22, 2003

ATTENDEES:

U.S. Environmental Protection Agency, OERR/ERT	C. Petullo
U.S. Environmental Protection Agency, ORIA/HQ	K. Klawiter
U.S. Environmental Protection Agency, ORIA/HQ	L. Bender
U.S. Environmental Protection Agency, ORIA/NAREL	V. Lloyd
U.S. Environmental Protection Agency, Region 2	N. Azzam
U.S. Nuclear Regulatory Commission, RES	R. Meck
U.S. Nuclear Regulatory Commission, RES	G. Powers
U.S. Department of Energy (EM-33)	A. Williams
U.S. Department of Energy (EH-41)	E. Boulos
U.S. Department of Homeland Security (formerly DOE/EML)	C. Gogolak
U.S. Air Force	R. Bhat

MEMBERS OF THE PUBLIC:

Cabrera Services, Inc.	S. Hay (U.S. Air Force Contractor)
SC&A, Inc.	D. Schneider (NRC Contractor)

DISCUSSION:

Introduction, Agenda, and Objectives

C. Petullo welcomed the attendees, who introduced themselves to a new participant from EPA, L. Bender, and reviewed the agenda. The primary purpose of the meeting is to review Chapters 3, 4, and 5 of MARSAME to facilitate preparation of the internal agency review draft of the document by second quarter 2004.

Workgroup members were given an opportunity to provide agency updates. R. Bhat mentioned a document, prepared by S.Y. Chen of Argonne Laboratory, for NCRP. Other Workgroup members were familiar with the document, which is more related to regulatory and other technical issues beyond survey methods.

Volumetric Contamination

A. Williams presented a brief white paper on residual radioactivity in volume. He outlined three forms of volumetric contamination which the Workgroup discussed. The three forms of volumetric residual radioactivity were: 1) where radioactive materials (soil, rubble, etc.) have been piled up, loaded into trucks, or deposited into drums or boxes, 2) where radioactive materials have been used to construct property or where radioactive solutions or effluents have seeped into and contaminated porous materials, and 3) where nuclear particles have caused the contamination *in situ*; where neutrons or other particles have activated the substance to some depth.

The first type of volumetric contamination that he identified occurs when radioactive materials, such as soil and rubble, have been piled, loaded into trucks, or deposited into drums or boxes. Such a scenario poses a potential problem in accessing the interiors of the waste volume from the surface. Detectors might be possible to use, but the thicker the material or the larger the pile, the less the instruments can detect contamination within the pile. In addition, naturally occurring radioactivity may serve as a confounder. He advised trying to avoid such a scenario in the first place by surveying the material before piling it, when the material is spread out and the surfaces are accessible, or sample it as it is being loaded.

If the material has already been piled or loaded into containers, implementing a specific protocol for volumetric contamination and hot spot detection can still be avoided by removing the material and spreading it out to measure its surface. For piles that cannot be spread, an iterative process can be applied where the surface of the pile is measured, a scoop of material removed for loading into a container, and the pile measured again.

R. Meck commented that such guidance should include visual inspection for sources in the material. To address nuclides that are difficult to detect, the guidance should discuss implementing a risk-informed process based on applicable regulatory requirements. Risk considerations present challenges to the development of the guidance because in addition to the technical considerations, the survey then must be considered in the context of regulation. A. Williams described an example of material in drums, where process knowledge can be used to determine what radionuclides are expected to be present and if the contamination is expected to be homogenous. Depending on what level of data are needed to release the material to a waste facility, measuring the drums with a drum counter may be sufficient. If the waste is not expected to be homogenous, or if strong sources are not expected, then the material would have to be spread out to measure the surface directly. It is more efficient to characterize prior to containerizing due to safety, cost, and dose considerations. G. Powers noted that such a process was actually characterization in preparation for selecting measurement types and methods. It is part of the historical assessment and decision process.

The Workgroup then discussed the second form of volumetric contamination considered by A. Williams, where radioactive materials have seeped into and contaminated porous materials, such as building materials. It is particularly relevant with regard to tritium contamination. While the Workgroup decided that this scenario is not substantively different than the first one, it does present a situation where there might be unusual isotopic characteristics and more difficulty in determining the maximum amounts of radionuclides that would be encountered. Contamination in building materials can be shielded by other materials, making volumetric contamination more difficult to determine. Areas of contamination should be identified and analyzed separately from materials not affected. Guidance is needed on the amount of coring and other measurements and sampling that is sufficient to find contamination. However, the Workgroup determined that once the materials are evaluated, sorted, and piled, they become covered under the first case.

R. Meck noted that such scenarios represent a departure from an "ideal" scenario and require an increasing reliance on historical assessment. Accompanying guidance should indicate how much reliance on historical assessment is too much and when the material must be spread out and measured to be cleared. Regulatory issues, such as waste acceptance criteria, will often drive the level of knowledge that one must have of the potential contamination in the piles to clear it. R. Bhat noted that while gamma contamination might be dealt with in this way, alpha or beta contamination is more difficult to detect cost effectively. R. Meck outlined what might be considered the elements of an "ideal" or "easy" case, such as good historical assessment, the presence of a gamma emitter, and the ability to conduct a visual inspection. He suggested that the guidance begin with such an example, then lead to more challenging scenarios where one or more elements are not possible.

Measurement Difficulty Hierarchy: Easiest

- Materials: spread out
- Visual inspection: yes
- Gamma measurements: yes
- Historical assessment: high quality (optimal would be if the inventory includes maximum actual contamination)
- Homogeneity: yes

If one of the above elements is missing, the other aspects must be stronger in order to compensate, particularly the historical assessment. These points will be expanded on in the section on volumetric contamination, as well as highlighted where they already exist in the document, since they can also apply to instrument and measurement selection for non-volumetric contamination.

A. Williams' third case involves nuclear particles which have caused contamination *in situ* by activating the substance to some depth. This case would require substantial evaluation, through coring or other analyses, to find non-gamma emitters. The distribution of radioactivity would not be completely evident and presents the potential for non-homogenous contamination. Cases of induced radioactivity at depth are especially relevant with regard to particle accelerators and nuclear reactors.

The Workgroup considered what other analyses would be appropriate for such cases. Lessons learned from similar facilities, surrogate analyses, and modeling of the fluence rates of neutrons could be used to help determine where contamination might be expected and to take judgmental samples. Ideally, samples should be collected before items are turned to rubble, or before they are piled. If this is not possible, sampling cannot be avoided. Hard data are required to satisfy most regulations, and compliance is based on tangible actions and evidence, as described in the paper on the Daubert factors. C. Petullo will ensure that all Workgroup members have a copy of the paper and will ask the author to speak at a Workgroup meeting. V. Lloyd also suggested Steve Frye at Paragon Laboratories in Ft. Collins, CO, as another good source of information on this topic.

Issues to keep in mind and focus on when addressing volumetric contamination, including the selection of measurement techniques and historical assessment, will be presented in S. Hay's chapters of MARSAME. R. Meck suggested that the beginning of each section will focus on an ideal case and then break down the areas of potential difficulty as the reader moves through the section. The discussion of volumetric contamination will relate to the level of certainty in taking measurements, assuming that surfaces can be measured while deeper contamination cannot be measured from the surface.

<u>FAQ and MDC Development Update</u>

C. Gogolak, is now officially a member of the Workgroup as the representative of the Department of Homeland Security.

He updated the Workgroup on his progress in developing the FAQs and the MDC discussion. R. Coleman provided him with factors that are important with regard to uncertainty, and the rest of the Workgroup should also provide input. At the request of R. Meck, Harry Chmelynski of SC&A prepared two papers during MARSSIM development that are relevant to C. Gogolak's work. The first discussed analyzing multiple radionuclides by using surrogates when the radionuclides are related and applying the Unity Rule when they are not. The paper, which relates to Appendix I, mainly considered the situation when there is not a distinct relationship and some uncertainty exists. It examined the level of certainty needed when applying the ratios. For use in MARSAME, the discussion should also address the derivation of the ratios themselves. Uncertainties exist due to the variability of ratios, but no uncertainty is assumed in MARSSIM when dealing with radionuclides that are exactly related.

The other paper covered instrument MDC for the final status survey design. When given a fixed grid size and measurement criteria, a certain MDC is implied, and the real DCGL can be determined. Whereas the first paper looked at ratios of radionuclides to propagate the error based on real data, the second paper considered the ratio of the MDC to the DCGL. The MDC tells if radiation is present in the sample. Action is taken if it is present, and no action is taken if it is not. The amount of radiation present does not matter. In MARSSIM, detection itself is not the criterion, but whether the amount detected is above or below a certain level within some preset degree of uncertainty. Therefore, the Workgroup was considering a test where the MDC was less than the DCGL, which led to the maximum quantifiable concentration (MQC), which is the concentration at which the relative uncertainty is ±10%. The MDC divided by the DCGL should be less than one, and the smaller it is the better. The paper related the impact of different levels of the MDC on the relative shift and would be helpful if the conclusion is clarified. Therefore, C. Gogolak will assist R. Meck in directing Harry Chmelynski on how to proceed with finishing the papers in September.

C. Gogolak also reported that the overview of MARSSIM which he presented at a meeting of the American Chemical Society generated much interest. At the request of Cheryl Trottier, he will give a similar presentation at the NRC Light Water Reactor meeting in October. He will continue working on the MDC and other FAQs and the MDC chapter. A conference call with the Workgroup to discuss the draft FAQs will be held sometime between the meeting with the SAB in October and the December Workgroup meeting; a date will be set on October 21. The SAB meeting will take place on October 21, possibly followed by a meeting of the Workgroup on October 22.

SAB-RAC Presentation Development

Using the presentation given previously to the SAB-RAC, the Workgroup began developing the presentation for the October 21 meeting, which will cover the key issues that the SAB raised at the previous meeting. The meeting will extend for a full day on October 21 and conclude the next morning. At the suggestion of V. Lloyd , the presentation will open with a review of the Workgroup's questions to the SAB and the concerns described by the SAB at the previous meeting. It will then cover the progress to date in resolving the questions and what remains to be done.

The Workgroup began by refining the purpose of MARSAME, stating that it is intended to provide guidance on measurements for release (rather than administrative guidance) to optimize a release survey protocol (rather than to develop an efficient protocol), considering certain issues. With regard to material being released, the Workgroup added the nature of the potential activity and other text to convey volumetric contamination. To address the SAB's question about the relationship between MARSSIM and MARSAME, the Workgroup used text from K. Klawiter's presentation to the Health Physics Society. A new slide will show progress and clarifications since the previous meeting. Progress will include a mention of FAQ development relevant to MARSSIM. C. Gogolak will provide some bullet points on the FAQs for the presentation.

The flow charts will be included in the presentation, labeled as working drafts, to address the SAB's request for a roadmap. The Workgroup discussed revisions to the flow charts. The boxes considering whether the MDC is less than or greater than the DCGL, and whether an item passes or fails, apply to both accessible and inaccessible areas. N. Azzam was tasked with revising the flow charts and ultimately finalizing them using the regular format for decisions and results in flow charts.

The Workgroup reviewed the minutes from the SAB meeting to identify topics, including: the use of modeling and how it interfaces with the document; monitoring of inaccessible areas; restricted v. unrestricted release of materials; volumetric v. surface contamination; sentinel areas; and orphan sources and TENORM (serving as confounding factors).

The Workgroup discussed the SAB's comment regarding the lack of a free-release scenario for clearance in MARSAME. At the October meeting, the Workgroup will ask the SAB for clarification on whether it was requesting an example of a clearance scenario, or if the comment referred to MARSAME's interface with modeling and possible problems that may be encountered during the release survey. V. Lloyd noted that many SAB comments related more to reuse than other types of release.

The Workgroup will note in the presentation that it does not agree with the SAB's comment that a discussion on when and how to use smears for release should be included. Smears are defined in MARSSIM as a diagnostic tool to determine if further investigation is necessary, because smears do not produce quantitative results.

More detail than originally planned will be added to the document on accurate monitoring and data quality, while at the same time avoiding prescriptive guidance.

The Workgroup will develop functional scenarios that better define the problem and issues and are more specific with regard to monitoring and measurement methods.

To address another of the SAB's concerns, S. Hay has already added some text on sentinel areas.

The Workgroup considered the SAB's comment on moving from measured data to a dose estimation. If the probability of missing some contamination is increased, the risk of doing so should be quantified and factored into the decision criteria. However, such an approach would be up to the regulator and therefore out of the MARSAME scope.

The SAB expressed concern about people picking up alpha contamination on their clothing from radon decay products and causing a false positive. Since those who perform scan-out surveys are aware of this issue already, the Workgroup does not feel that it bears more than a brief mention.

The SAB also asked about accelerators. Because there is not a single regulatory structure for accelerators, MARSAME will cover this topic through its overall approach.

The Workgroup noted that a reference area may be the object of concern itself. A survey of the object should be performed prior to its use in a radiation area. This information would then be used as the reference area for the final status survey. This represents a significant difference from MARSSIM, since the ability to survey an object before it becomes contaminated was not possible under MARSSIM.

R. Meck noted that the inclusion of more examples in MARSAME would be desirable, and several possibilities should be mentioned in the presentation. The SAB should be asked for feedback on which three would be the most useful. The examples include the following:

- university of research and development laboratory (with isotopes typically used at a university)
- nuclear accelerator
- hospital facility (trash)
- pile of demolition debris
- personal property from nuclear power plant (operations and closure)
- reuse of equipment
- mine/mill property
- military - depleted uranium (DU)

Scenarios could be combined. For example, the reuse of equipment could be addressed in a nuclear power plant or other setting. The impact of radon on surveys in general should be covered. The Workgroup noted that releases related to operations are not different than those related to closure. A. Williams will identify the nuclides associated with each of the scenarios to facilitate the selection of scenarios to combine.

R. Meck suggested that each example should teach a specific lesson as part of the scenario, such as the sum of fractions or use of conveyor belts. Therefore, the Workgroup should ask the SAB for advice on what principles, concepts, processes, and techniques for each example most need to be conveyed.

Using the Workgroup’s input, C. Petullo developed a draft presentation during this week’s meeting to provide to the Workgroup for comment on Friday, September 26.

TUESDAY, SEPTEMBER 23, 2003

ATTENDEES:

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U.S. Environmental Protection Agency, ORIA/HQ	L. Bender
U.S. Environmental Protection Agency, ORIA/NAREL	V. Lloyd
U.S. Environmental Protection Agency, Region 2	N. Azzam
U.S. Nuclear Regulatory Commission, RES	R. Meck
U.S. Nuclear Regulatory Commission, RES	G. Powers
U.S. Nuclear Regulatory Commission, NMSS	A. Huffert
U.S. Nuclear Regulatory Commission, NMSS	J. DeCicco
U.S. Department of Energy (EM-33)	A. Williams
U.S. Department of Energy (EH-41)	E. Boulos
U.S. Department of Homeland Security (formerly DOE/EML)	C. Gogolak
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MEMBERS OF THE PUBLIC:

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Oak Ridge National Laboratory	R. Coleman (DOE Contractor)
SC&A, Inc.	D. Schneider (NRC Contractor)
SC&A, Inc.	R. Abedin (NRC Contractor)

DISCUSSION:

Review of Chapter 3 of MARSAME

The Workgroup worked through Chapter 3, discussing the text as well as the questions posed by S. Hay during the development of the chapter.

The Workgroup discussed the relationship between regulatory, administrative, and institutional limits in Section 3.1 on release limits. Administrative limits are often, but not always, set according to regulatory limits. Action guidelines and the amount of work required for compliance with them will vary based on their stringency and the complexity of the task. MARSAME should not focus on the idea of limits but rather relate release limits to the intended use of the materials and emphasize the fact that they serve as action guides. R. Meck noted that the release of materials and equipment into general commerce should not be referred to in terms of "protect(ing) human health and the environment," because the radiation levels at issue in clearance are already much lower than the 100 mrem/year limit already in place to protect health. V. Lloyd , C. Gogolak, and R. Meck worked together to prepare new draft text for presentation to the Workgroup on Wednesday.

S. Hay noted that he used the term "release limits" rather than "release criteria," as was used in MARSSIM, since MARSSIM defined a release criterion as a regulatory limit. The term "release limit" is broader and can include administrative and institutional limits as well as regulatory limits. This terminology must be consistent throughout MARSAME and the term "release limit" defined in the glossary.

An example about the concentration of radionuclides during incineration will be added to Section 3.1, lines 41-44. A. Williams will provide information and data on incineration to R. Meck.

C. Gogolak had concerns about the discussion of DCGLs, which used the definition of DCGL from MARSSIM. In the case of MARSAME, the DCGLs are also based on the transport of material and how individuals are exposed to it. Once the term "DCGL" is defined for the purpose of MARSAME, the definitions of "$DCGL_C$," "area factor," and "volume factor" will be easier to develop, as well as their relationship to the $DCGL_{EMC}$.

The beginning of Chapter 3 should note that changes in definitions will occur as scenarios become more complex. At the most basic level, a survey unit is that which will be the object of a decision. In order to make that decision, certain data must be found, and MARSAME will describe how to measure and obtain the data. However, once the actual survey unit is defined for practice, the situation will become more complicated. S. Hay will describe the derivation of the DCGL from the risk- and dose-based limit, as well as other subsections, including defining the survey unit and the interface with modeling, in more detail. Modeling will be described in terms of its use in conjunction with the release limits to derive a DCGL. The text will emphasize that MARSAME is a measurement document, although it should mention issues involving the appropriateness of the DCGL, given the ultimate use of the released material. The definition of area factor from the MARSSIM glossary should be included. It was suggested that the discussion of $\mathbf{F}_T$ equal to $\mathbf{F}_M$ and $\mathbf{F}_s$ approaches 0 for *in toto* and scan only surveys be moved to an appendix, along with a discussion of the specifics of survey design.

The Workgroup discussed the material to be covered in Section 3.2.3, on gaseous materials. The section should cover containerized gases, rather than discharges of gases to the atmosphere, just as the previous section on liquids covers liquids in a container, not those released into a stream, for example. Accelerators and research reactors are most likely to deal with containerized gases. The guidance should address gases in terms of how to measure gases in a container for release of the container. While measurement with a gamma spectrometer may be possible, in some cases the gas in the container will have to be sampled directly.

Uncontained gases will not be covered in terms of releasing the gases themselves. Instead, MARSAME should mention that non-equilibrium radon issues, such as radon's role as a confounder and its impact on a survey unit, must be taken into account, recognizing that this is a modeling issue and not a measurement topic. Radiation emissions can be absorbed into other materials through an airborne pathway and these effects can be modeled. However, the measurement of contamination and the release decision itself will be based on the solid that absorbed the gaseous radiation, making it a contaminated solid. The release of uncontained gases is handled in the context of effluent regulations, such as NESHAPs.

R. Meck noted that Section 3.3 on survey units should be connected back to understanding the derivation of the DCGL. He suggested referring readers to NUREG-1640 for examples of survey units. Since not all Workgroup members are experienced in the application of NUREG-1640, R. Meck will present that topic to the Workgroup at the December meeting. R. Bhat mentioned that including guidance on average, recommended maximum, and recommended minimum survey unit sizes would be helpful, but the Workgroup noted that such suggestions and examples in MARSSIM were taken as requirements and applied directly by MARSSIM users. C. Gogolak explained that while NUREG-1640 could be given as an example of how to determine a dose-based scenario, not all MARSAME users will be working within a dose-related regulatory framework. Therefore, users must understand how to apply the size of the survey unit to cases where NUREG-1640 is not applicable. He suggested providing a detailed example of how the users could find the appropriate value themselves. R. Bhat suggested that detailed pros and cons outlining two different approaches to the same problem in a practical example would be useful in showing MARSAME users how to adapt the guidance to their own situations. The Workgroup agreed that the approach for defining a survey unit would be given in Section 3.3 and described in more detail later in the document. Given the propensity of users to use numerical examples as de facto guidance, the Workgroup agreed to delete Table 3.1 on typical material survey unit sizes.

The Workgroup then discussed the difference between sentinel and surrogate measurements in Section 3.4. Surrogate measurements refer to the correlation between what can be measured in one case with what is more difficult to measure in another. For example, the Workgroup considered a large pump as a survey unit. Measurements made on one side of the intake or turbine can be used as surrogates for measurements on the other side. In addition, certain radionuclides can also be used as surrogates for other radionuclides. Sentinel measurements refer to key locations in different scenarios where contamination would be concentrated if it were present. If measurements are made in these places and contamination is not found, the entire object is probably not contaminated. S. Hay will elaborate on these distinctions in the document. This issue will be revisited with S. Doremus, who had originally raised the question, at the next meeting.

The Workgroup moved on to Section 3.5. Because MARSAME can be used for contaminations in solids, liquids, or gases, the references to "solid" materials in the section will be removed. When defining Classes 1, 2, and 3, S. Hay will ensure that they are consistent with the updated definitions from MARSSIM which are on the MARSSIM website. For Section 3.5.4 on special considerations for small activity quantities and short half-lives, R. Meck will provide a paragraph on a paper he prepared, which discusses the derivation of an arbitrary probability that all of a particular radionuclide with a small activity quantity or short half life is gone. This approach can be used as a short cut to determining the presence of contamination, where time is measured instead of concentration.

Section 3.6 describes the selection of background reference materials and equipment. The topic is currently introduced in Chapter 2. R. Meck suggested moving the overview of background radiation from Chapter 2 to an appendix. Section 3.6 should cover practical guidance and specifics about issues that may arise, such as details of activity levels that might be expected and the selection of reference areas. The table currently in Chapter 2 will be moved to Section 3.6.

The Workgroup discussed the inclusion of a table in Section 3.7 on the selection of instruments and survey techniques. The Workgroup decided to include the parts of MARSSIM Table 4.1 that cover the measurement of the surfaces of structures and combine it with the information on measurement technologies for volumetric contamination from the third page of Table B-3a from NRC draft NUREG-1761, provided by G. Powers. S. Hay will prepare the table, including standard units in addition to Bq/m^2. G. Powers suggested developing an appendix on instrumentation that is complete and easily updated.

For Section 3.7.3, the Workgroup discussed the types of homeland security issues which would be covered by MARSAME. MARSAME will not be applicable to measuring radiation on people. R. Meck noted that in terms of screening levels for dispersed sources (not concentrated sources that are shielded), the MDCs for clearance should be satisfactory for homeland security.

[Discussion of Chapter 3 continued after the Scrap Metal presentation (pg. x)]

EPA Detection of Radioactive Material in Imported Scrap Metal Pilot Project: Presentation by Sally Hamlin and David Kappelman, EPA

Sally Hamlin, EPA, ORIA/RPD, and David Kappelman, EPA, ORIA/NAREL, presented to the Workgroup an overview of an EPA project with the Bureau of Customs and Border Protection that relates to detecting radiation contamination in large volumes of material. The project was originally developed because of the effects of orphan sources of radiation on commerce.

At the request of Congress, the Bureau of Customs and Border Protection initiated a study with EPA to monitor imported scrap metal entering U.S. ports for radioactive contamination. Radioactive sources in scrap metal can be melted in with the metal, resulting in the contamination of consumer metal supplies, significant financial impact for the melt facilities, and health risks for their workers and the general public. Orphan radioactive sources that have fallen out of regulatory control have been detected in scrap shipments in western Europe, so the United States is focusing initially on imported scrap metal shipments.

The project is intended to determine the amount of contaminated metal in the United States that comes from contaminated imports to determine if development of a standard is necessary. The project evaluates the feasibility of mounting radiation detectors directly onto the equipment used at the off-loading ports, by developing a pilot program of detection and response protocols with industry participation that may be expanded to other ports and maintained by industry. The pilot project is currently in place at a port in Darrow, Louisiana, and at the Port of North Charleston, South Carolina. All scrap metal imported is monitored at each facility, and the system is in use 24 hours a day, seven days per week.

The project requires evaluating scrap delivered in large freighters, with approximately 65,000 tons of scrap in the hull of each ship. The density and type of material vary, and portal monitors and other common measurement methods are not effective. In order to accurately detect radiation, the total volume of scrap must be divided into smaller volumes during sampling to increase the probability of detection. The position of the source and the variation in the density of the material will affect the level of activity detected. The detection method must have minimal interference with commerce. Equipment must be rugged. Finally, the equipment and sampling protocols must be validated and repeatable.

To achieve these requirements, EPA selected the Rad/Com Cricket system, manufactured by Rad/Com Systems in Ontario, Canada. The system is a large area detector which fits in the base of the grapple used for off-loading scrap metal from the freighter's hulls. The grapple varies in size between eight and 15 yards. The detector consists of two plastic scintillation detectors with two photomultiplier tubes surrounded by high strength protective shielding. The detectors, approximately 2' x 4' x 6" in size, communicate with the alarm system without wires. The detector evaluates each load of scrap as it is carried by the grapple from the freighter hull. If radiation is detected, an alarm sounds for the crane operator as well as in another selected location. The crane operator then separates that load from the rest and continues working. The load is evaluated separately to determine the nature of the contamination. If two loads in a row set off the alarm, the entire freighter load is considered suspect for contamination. Daily quality control checks are performed by stevedores to ensure that the system remains functional.

Data are logged every five seconds in the form of counts at each time. EPA is using the data to verify that daily QC checks are performed. If positive readings were found, the data could be evaluated but still would not provide much information. In the future, standard operating procedures will require data logging at the beginning of every shift, but not data logging of the entire operation. There is no separate QC log for the pilot program.

Both neutrons and gamma radiation can be detected and set off the system's alarm. However, the system does not differentiate between the two or provide any information on what radionuclide is present. Each grapple load is considered a survey unit, and a decision is made for each grapple load based on whether the alarm goes on or not as a result of the direct measurements made by the system.

The industry is currently implementing the project, with oversight from EPA. No positive detections for radioactive scrap have been found by the pilot project to date, but several positive detections have occurred in Europe using the same system. The pilot project is being evaluated for use at other ports of entry.

Review of Chapter 3 of MARSAME (Continued)

After the presentation and discussion, the Workgroup returned to its review of Chapter 3. The current draft of Section 3.7 covers only MDCs; S. Hay asked the Workgroup to identify other aspects of instrument selection that are different from what was discussed in MARSSIM and should be included in MARSAME. V. Lloyd suggested that issues such as the physical nature of the materials, the suspected nuclides of contamination, and whether or not a scan was possible should be discussed first in the section before covering MDCs. Many of these topics are already in Chapter 3 in the sections on solids, liquids, and gases. R. Coleman noted that Chapter 4, on survey planning and design, also began by considering these topics, while S. Hay thought that Chapter 4 should be more concerned with the number of samples and other such issues. Because of the number of issues involved, the Workgroup decided to continue discussion of Section 3.7 on Wednesday.

Section 3.8.2, on survey difficulties, includes a discussion of homogeneity. The Workgroup noted that striving for homogeneity in the normal course of identifying a survey unit is acceptable, but using it to dilute the contamination present would not be. The guidance should state that the technique can be used to make surveying easier, but heterogenous items should not be intentionally added to make something that is contaminated pass. Impacted and nonimpacted materials should not be mixed together; items that have already been identified as Class 1, Class 2, or Class 3 should not be mixed with other classes.

The Workgroup discussed topics for Section 3.9, on special considerations for quality control. This section should cover the visual inspection process and the identification of orphan sources, and possibly the supplementation of a scan of less than 100 percent with measurements.

MARSAME does not expand on the reference coordinate system and health and safety, which were covered in MARSSIM. The Workgroup agreed to decide whether or not to cover these topics on Wednesday.

WEDNESDAY, SEPTEMBER 24, 2003

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U.S. Environmental Protection Agency, OERR/ERT	C. Petullo
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DISCUSSION:

Review of Chapter 3 of MARSAME (continued from Tuesday, September 23)

Supplemental Information for Insertion in Chapter 3

The Workgroup continued its review of Chapter 3, discussing the text as well as the questions posed by S. Hay during the development of the chapter. V. Lloyd presented a new paragraph on “release limits” to insert in Section 3.1, which she wrote in collaboration with C. Gogolak and R. Meck. V. Lloyd also wrote an additional paragraph to insert in Section 3.2. S. Hay will incorporate both these additional paragraphs in the next draft of MARSAME.

The Workgroup revisited the “Reference Coordinate System” and “Health and Safety” issues highlighted in lines 366-368 of Chapter 3 and decided and that these issues could be deleted and would not be addressed in MARSAME.

There was continued discussion on the table proposed in Section 3.7 and whether the Workgroup envisions a table similar to the one in MARSSIM (i.e., Table 4.1) and whether such a table belongs in Chapter 3 or elsewhere in MARSAME. The Workgroup decided to insert this table in Section 3.7 for now and to revise it to include information from MARSSIM Table 4.1 and Table

B-3a/b from NUREG 1761 (a copy of which was provided by G. Powers at this meeting). S. Hay was asked to combine the relevant information from both these tables to create a new table for insertion in Section 3.7.

Addressing Homeland Security and Scenario B Issues

The Workgroup recognized that homeland security issues are summarily addressed in the section on instrument selection, but should also be addressed under the section on survey techniques. The Workgroup also suggested that homeland security be introduced and discussed in the section on release limits. R. Meck reiterated the importance of clarifying the applicability of homeland security issues in the scanning of equipment and materials, e.g., for illegal trafficking. However, for purposes of MARSAME, the scope of the homeland security discussion should be limited to show applicability in terms of radiation detection instruments.

MARSAME will need to emphasize Scenario B, which addresses homeland security issues and is not covered in MARSSIM. However, the Workgroup agreed that the surveying framework is the same for both manuals since the survey process will not be affected by the scenario under investigation. Whether the survey involves a detection point for the release of materials or an accident or terrorist attack that requires cleanup / post-RDD cleanup, the survey method will not be altered. Since MARSAME will contain lengthy discussions on new kinds of monitoring and survey instruments, the Workgroup decided to put all these discussions in the Appendix.

Review of Chapter 4 of MARSAME

Consistency of Terminology and Definitions

Where possible, the Workgroup asked the writers to avoid the use of the word “contamination” and its derivatives by using “radiologically controlled” when referring to areas and “residual radioactivity” when referring to equipment and materials. However, since DOE and NRC interpretations of the term “radiologically controlled” differ, the Workgroup advised writers to use the terms “radiologically controlled” and “impacted areas” to accurately define specific situations. The Workgroup endorsed R. Coleman’s use of the term “difficult-to-access” to substitute for the term “inaccessible” and suggested that all the writers use this revised terminology throughout the document.

The Workgroup recommended the use the term “clearance” as opposed to “radiological release.” At this point, R. Meck reiterated the distinction between “release” and “clearance” as these terms are understood by the international scientific and regulatory community, i.e., “clearance” applies only to licensed operators while “release” applies to all other activities. Therefore, in the international scientific and regulatory community, “release” is a broader concept that encompasses “clearance.” However, the Workgroup decided that for purposes of MARSAME, “release” will be used to incorporate “clearance” and this distinction will be made in the glossary.

The Workgroup modified existing MARSSIM definitions to reach consensus on the definitions of the following key terms for MARSAME:

- Impacted area - any area that is not classified as non-impacted. Areas with a reasonable possibility of containing residual radioactivity in excess of natural background or fallout levels.

- Clearance - release of materials from regulatory control (does not apply to terrorist acts).

- Release - removal of materials from administrative, institutional, or regulatory radiological control.

The Workgroup discussed the interchangeable use of the terms "release criteria" and "radiological criteria" in MARSAME and decided that these terms should be replaced by "release limit," where appropriate. The Workgroup also agreed that it must be emphasized in both the text and the glossary that "release limit" refers to a *radiological* release limit. After reaching this decision, the Workgroup realized that the term "detection limit" is also used in Scenario B cases. To resolve this discrepancy, the Workgroup decided that for purposes of MARSAME, everything is captured under the term "release limit." This distinction will be clarified in the glossary.

The Workgroup consulted the National Research Council's definition of "surface contamination" as published in "The Deposition Dilemma," to derive a corresponding definition in MARSAME. The Workgroup decided that "surface contamination" will be referred to as "surficial radioactivity" in MARSAME. The existing MARSSIM definition for "surface contamination" was then modified to arrive at the following definition for "surficial radioactivity" in MARSAME:

- Surficial radioactivity - residual radioactivity found on surfaces and expressed in units of activity/surface area (Bq/cm^2 or $dpm/100\ cm^2$).

By making this change, the Workgroup recognized that the use and definition of the above term will differ from MARSSIM, giving rise to an internal inconsistency between MARSSIM and MARSAME, which is a supplement to MARSSIM. However, the Workgroup envisions this to be short-term issue since it is expected that MARSSIM will also be revised in the future to reflect the altered definition.

The Workgroup also consulted the ANSI/HPS (1999) definition for "volumetric contamination" to derive a corresponding definition in MARSAME. The existing MARSSIM definition for "volumetric contamination" was then modified to arrive at the following definition for "volumetric radioactivity" in MARSAME:

- Volumetric radioactivity - radioactive material residing in or throughout the volume of an item, may result from neutron activation or from the penetration of radioactivity into cracks or interior surfaces within the matrix of an item or solid state diffusion.

After discussing the ANSI/HPS (1999) definition's applicability to both MARSAME and MARSAS, the Workgroup decided to revise the above definition as follows for use in the supplements:

- Volumetric radioactivity - residual radioactivity residing in or throughout the volume of a solid, liquid, or gas.

In response to R. Coleman's request for clarification, the Workgroup discussed the use of the terms "direct measurement," "*in-situ* measurement," and "*in-toto* measurement" to ensure that the context and nature of their use in Chapter 4 were consistent with the MARSSIM definitions. Based on the Workgroup's input, R. Coleman will review the use and interrelatedness of the above terms to ensure that they are used correctly in Chapter 4 and are consistent with the MARSSIM definitions.

R. Coleman then defined his use of the terms "investigation level" and "action level" in Chapter 4 and asked for clarification from the Workgroup regarding these definitions. R. Coleman defined "investigation level" as an alert mechanism and "action level" as an indicator at which action must be taken to correct an error. C. Petullo will review the use of the term "investigation level" in MARSSIM to see if it is consistent with R. Coleman's definition above.

Extended Survey Design Information in Appendices

R. Coleman inquired whether MARSAME should present rigorous survey design and structure information in Chapter 4. The Workgroup decided that this kind of information may be misinterpreted as mandatory requirements. To prevent it from being too prescriptive and to encourage its use as a road map for all radiological surveys, the Workgroup decided that MARSAME will present complicated scenarios in the Appendices that can be consulted when designing a survey.

Discussion on "Smears" in Section 4.3.1.3

The Workgroup suggested that the discussion on "smears" in Section 4.3.1.3 should be expanded to emphasize that smears may be useful as semi-quantitative tools but cannot be used exclusively as release criteria. The Workgroup suggested an explicit statement emphasizing that smears cannot be used as stand-alone release criteria, except in a few cases with special circumstances.

Quantitative/Statistical Discussions for Chapter 4

R. Meck inquired whether, in the context of background radiation measurement variations, homeland security and interdiction issues will be discussed in Section 4.3.5. He asked if background levels will be determined through human measurements or through algorithms for homeland security scenarios. C. Gogolak will address the above issues and develop quantitative/statistical discussions for incorporation into Chapter 4.

Future Direction of Chapter 4

For the next draft, Chapter 4 will be revised to include more information on conducting specific surveys. S. Hay suggested the inclusion of more prescriptive information to guide users in designing and developing surveys. To accomplish this, he proposed expanding the discussions on the flow charts that were created at the August 2003 MARSSIM Workgroup meeting. The Workgroup will review the flow charts and be prepared to discuss them at the next day's (Thursday, September 25) meeting.

S. Hay and R. Coleman noted that certain sections of Chapters 3 and 4 overlapped. Therefore, they will collaborate to consolidate these chapters, where appropriate. The Workgroup members will identify possible areas of overlap and formulate a method for combining these chapters for the next day's (Thursday, September 25) meeting. S. Hay and R. Coleman also volunteered to separately discuss the reorganization of Chapters 3 and 4 after the meeting had adjourned for the day.

THURSDAY, SEPTEMBER 25, 2003

ATTENDEES:

U.S. Environmental Protection Agency, OERR/ERT	C. Petullo
U.S. Environmental Protection Agency, ORIA/HQ	K. Klawiter
U.S. Environmental Protection Agency, ORIA/HQ	L. Bender
U.S. Environmental Protection Agency, ORIA/NAREL	V. Lloyd
U.S. Environmental Protection Agency, Region 2	N. Azzam
U.S. Nuclear Regulatory Commission, NMSS	J. DeCicco
U.S. Nuclear Regulatory Commission, RES	R. Meck
U.S. Department of Energy (EM-33)	A. Williams
U.S. Department of Energy (EH-41)	E. Boulos
U.S. Department of Homeland Security (formerly DOE/EML)	C. Gogolak
U.S. Air Force: R. Bhat	

MEMBERS OF THE PUBLIC:

Oak Ridge National Laboratory	R. Coleman (DOE Contractor)
Cabrera Services, Inc.	S. Hay (U.S. Air Force Contractor)
SC&A, Inc.	R. Abedin (NRC Contractor)

DISCUSSION:

Revisions to Flow Charts

The Workgroup resumed its discussion on the flow charts that resulted from the August 2003 MARSSIM Workgroup meeting. Revisions to these flow charts were intended to provide more detailed discussions in Chapter 4 of the different survey unit scenarios. The Workgroup discussion began with a review of the Class 1 scenario.

At this point, C. Petullo directed the Workgroup to focus on other agenda items while K. Klawiter and S. Hay met separately to create detailed flow charts based on the Workgroup's input on the Class 1 survey unit scenario. N. Azzam was tasked with reproducing K. Klawiter's handwritten flow charts in PowerPoint so that these revised flow charts could be presented to the Workgroup for further discussion at the next day's (Friday, September 26) meeting.

Reorganization of MARSAME Chapters

The Workgroup addressed the reorganization of MARSAME that would result from combining Chapters 3 and 4. E. Boulos distributed a revised outline that he had compiled to address the reorganization of chapters and sections in MARSAME. The Workgroup then combined the information in Chapters 3 and 4 to arrive at the following strawman outline:

- Chapter 1 (introductory chapter that has not been written yet)

- Chapter 2 (“Historical Assessment”) - at the end of this chapter, reader must have adequate information to determine whether his/her survey unit is impacted or non-impacted.

- Chapter 3 - this new chapter will likely be titled “Final Status Survey Considerations, Planning, and Design” and will be a combination of the current Chapter 3 (“Preliminary Survey Considerations”) + Chapter 4 (“Survey Planning and Design”).

- Chapter 4 - this new chapter will discuss survey design, providing descriptions on what will be measured and how these measurements should be recorded based on the survey unit determination.

- Chapter 5 - this chapter will address data quality issues; discuss volumetric vs. surface issues; evaluate the survey design; identify data quality objectives (DQOs); verify the data used; and teach the reader how to determine whether the survey followed a technically defensible approach.

In reviewing the strawman outline above, the Workgroup decided that there was a need for supplemental information in the form of an “implementation” chapter that needs to be inserted between Chapter 4 (the planning phase) and Chapter 5 (the assessment phase). Further scrutiny of the strawman outline brought about the question of whether the Workgroup should address survey design from a “type of survey, i.e., scan only, survey only, or scan + survey” approach rather than a “type of radioactivity, i.e., surface vs. volumetric (bulk)” approach. Currently, MARSAME discusses survey design using the following two-pronged approach:

Surface	**Volumetric (bulk)**
Scan only	Scan only
Scan + Static	Scan + Static
In-toto	*In-toto*

R. Coleman and S. Hay proposed a variation to the above approach and asked the Workgroup to consider using the following three-pronged approach:

Scan only	**Scan + Static**	***In-toto***
Surface	Surface	Surface

Volumetric (bulk)	Volumetric (bulk)	Volumetric (bulk)

The Workgroup discussed whether MARSAME's revised Chapter 3 should replicate some of the issues covered under MARSSIM's Chapter 4, e.g., radionuclides of concern, measurement techniques, survey instruments, reference areas, survey units, and classification. The Workgroup decided that these issues should be addressed in the revised Chapter 3, along with conveyerized survey measurements and other innovative measurement techniques that had not been previously discussed in detail in MARSSIM.

In reviewing the various issues that would be covered under the revised Chapter 3, the Workgroup realized that it will be a long chapter and a seamless transition between Chapters 3 and 4 will be needed to avoid possible overlap. C. Gogolak suggested using the seven-step DQO process to revise the strawman outline and provide a familiar framework for the users. Using the DQO process, the Workgroup developed the following content for the MARSAME chapters:

- Chapter 1 (introductory chapter that has not been written yet)
- Chapter 2 - *Define the Problem + Identify the Decision (DQO step #s 1, 2)*
- Chapter 3 - *Inputs to the Decision Process (DQO step # 3)* - DCGL, release limit, radionuclides of concern, survey instruments, reference areas
- Chapter 4 - *Defining the Boundaries (DQO step # 4)* - survey units, classification, accessibility - site preparation
- Chapter 5 - *Decision Rules and Errors (DQO step #s 5, 6, 7)* - survey design
- Chapter 6 - implementation, quality control, health and safety issues
- Chapter 7 - data quality assessment, interpretation of survey results

Based on this revised strawman outline, the following writing assignments were made:

- Chapters 3 and 4 - R. Coleman
- Chapters 2 and 5 - S. Hay
- (Chapter 6 - on hold for now)
- Chapter 7 - C. Gogolak

C. Petullo requested that the writers of Chapters 2, 3, 4, and 5 have their drafts ready for review at the next MARSSIM Workgroup meeting during December 8-12, 2003.

Survey Design Scenarios or “School Problems”

In addition to reviewing the above chapters at the upcoming December 2003 meeting, the Workgroup will also review examples of hypothetical survey design scenarios that will be included in the MARSAME Appendices. C. Petullo envisioned that a whole day of the meeting agenda could be committed to discussing these survey design scenarios. A. Williams was tasked with formulating different survey design scenarios or “school problems” involving different facilities and radionuclides.

Review of Chapter 7 (formerly Chapter 5/6) of MARSAME

C. Gogolak introduced the review of this chapter by providing some historical context on MARSAME’s development as a multi-agency effort. He explained that NUREG 1761, a survey design document, was developed by NRC for its licensees to release materials. To address the release of materials and equipment under the jurisdiction of other Federal agencies, the MARSSIM Workgroup began developing MARSAME. Therefore, Chapter 7, as it currently stands, is mainly a compilation of NUREG 1761 and relevant sections of MARSSIM.

R. Meck suggested that homeland security and Scenario B issues, which C. Gogolak had discussed in his presentation at the Health Physics Society (HPS) meeting, be incorporated into the expanded scope of Chapter 7. C. Gogolak agreed to do so but reiterated that these issues need to be first introduced in the discussion on survey design in Chapter 5 and then later re-addressed in Chapter 7 as a check-point to see if the survey process was accurate in its derivation of the $DCGL_c$.

R. Meck inquired whether there was a need for displaying data, e.g., posting plot of results, in cases of release or interdiction. C. Gogolak responded that real-time display of the results and pictures of the vehicles would be helpful, however, unlike NUREG 1761, MARSAME does not require that data be logged at all times. Therefore, without the corresponding data, posting plots would not be possible. C. Gogolak offered to discuss the case of no logged data in Chapter 7 since this issue is not addressed in MARSSIM.

The Workgroup concurred that the ANSI (E4) reference, which is an interagency (EPA, DOE, and DOD) quality assessment project plans document, should be cited in Chapter 7. C. Gogolak will incorporate discussions on the ANSI document in Chapter 7. C. Goglak then explained to the Workgroup that unlike in MARSSIM, Chapter 7 of MARSAME will depend heavily on MDCs and Scan MDCs, and not as much on WRS and Sign tests. Therefore, the critical elements that need to be discussed in this chapter are the calculation of MDCs and how uncertainty can affect them. C. Gogolak stated that he will expand on the discussion of MDCs and Scan MDCs and provide examples to clarify these issues. Additionally, C. Gogolak will develop the concept of MQC in this chapter. He will discuss that MDCs are easier to implement because technicians can make the determinations, as opposed to MQCs, which are harder to implement because the data need to be compiled, averaged, and analyzed later.

FRIDAY, SEPTEMBER 26, 2003

ATTENDEES:

U.S. Environmental Protection Agency, OERR/ERT	C. Petullo
U.S. Environmental Protection Agency, ORIA/HQ	K. Klawiter
U.S. Environmental Protection Agency, ORIA/HQ	L. Bender
U.S. Environmental Protection Agency, ORIA/NAREL	V. Lloyd
U.S. Environmental Protection Agency, Region 2	N. Azzam
U.S. Nuclear Regulatory Commission, RES	G. Powers
U.S. Nuclear Regulatory Commission, RES	R. Meck
U.S. Department of Energy (EM-33)	A. Williams
U.S. Department of Energy (EH-41)	E. Boulos
U.S. Department of Homeland Security (formerly DOE/EML)	C. Gogolak

MEMBERS OF THE PUBLIC:

Cabrera Services, Inc.	S. Hay (U.S. Air Force Contractor)
SC&A, Inc.	R. Abedin (NRC Contractor)

DISCUSSION:

August 2003 MARSSIM Workgroup Meeting - Final Meeting Notes

The Workgroup reviewed the August 4-7, 2003 meeting notes and provided comments and corrections. R. Abedin will incorporate these revisions and e-mail the finalized August 2003 meeting notes to C. Petullo and R. Meck by Friday, October 3, 2003.

Revisions to Flow Charts for the SAB-RAC Presentation

The Workgroup resumed its discussion on the flow charts that resulted from the August 2003 MARSSIM Workgroup meeting. Prior to the Friday meeting, K. Klawiter had created detailed flow charts based on the Workgroup's input on the Class 1 survey unit scenario. N. Azzam reproduced K. Klawiter's handwritten flow charts in PowerPoint so that the Workgroup could review these revised flow charts.

As the Workgroup reviewed the handwritten and PowerPoint flow charts, the members realized the complexity of presenting the Class 1 survey unit scenario. The Workgroup concurred that since some of the Class 1 materials and equipment will be disposed of as radioactive waste, they will not be surveyed for release. Therefore, the majority of release surveys will be conducted for Class 3 materials and equipment. The Workgroup concluded that the Class 3 scenario should be included in the SAB-RAC presentation since the Class 3 example is expected to account for the majority of release scenarios. N. Azzam was tasked with updating and revising the flow charts for presentation to the SAB-RAC.

SAB-RAC Presentation and Follow-up MARSSIM Workgroup Meeting

The Workgroup’s consultation with the EPA-SAB-RAC on MARSAME will take place on Tuesday, October 21, 2003. The workgroup reviewed the draft presentation that C. Petullo had developed based on the Workgroup’s feedback at the Monday, September 22 meeting. The Workgroup members provided further feedback and comments.

The Workgroup scheduled to meet at NRC (Rockville, MD) for a de-briefing on the SAB-RAC presentation and discuss the survey design scenarios or “school problems” on Wednesday, October 22, 2003. Of the members who were still present at the meeting, R. Meck, A. Williams, L. Bender, E. Boulos, and C. Petullo indicated that they would be available to meet, while the rest indicated that they were not available or would need to check their schedules to confirm their availabilities. C. Petullo will e-mail the Workgroup with an agenda for this meeting.

Definition of “Acceptable Knowledge”

K. Klawiter presented a copy of the Federal Register Notice (67 FR 154) that contained the EPA’s definition of “acceptable knowledge” and explained that this term could not be used interchangeably with “process knowledge. ” According to EPA, “acceptable knowledge” is a more inclusive concept than “process knowledge,” including historical information and prior measurements and reports.

September 2003 MARSSIM Workgroup Meeting - Draft Meeting Notes

D. Schneider and R. Abedin will compile the draft meeting notes for the September 22-26, 2003 Workgroup meeting and e-mail them to C. Petullo, R. Meck, and V. Lloyd by October 3, 2003. V. Lloyd will review the draft meeting notes, insert comments in bold into the document, and distribute this edited version to the Workgroup for comments.

Next MARSSIM Workgroup Meetings

The workgroup will meet on October 22 following the SAB meeting on October 21. The agenda for this meeting includes:

- SAB-RAC “hotwash”
- Review and Refine Example Scenarios

Potential agenda items for the December 8-12, 2003 meeting included:

- Review of the revised drafts of Chapters 2, 3, 4, and 5

- Continued discussion on the survey design scenarios or “school problems”
- Overview of the SAB-RAC comments
- Refinement of the overall survey scenario flow charts

ATTACHMENT 1

SEPTEMBER 2003 MARSSIM WORKGROUP ACTION ITEMS

N. Azzam

1. Update the flow charts according to the comments of the Workgroup.

2. Search within EPA (e.g., Superfund site, through ORIA, or other divisions) to determine if there is an existing definition for subsurface or volumetric radioactivity.

E. Boulos

1. In conjunction with A. Williams, determine whether funding is available for R. Coleman to complete his chapters.

R. Coleman

1. Review the use and interrelatedness of the terms "direct measurement," "*in-situ* measurement," and "*in-toto* measurement" to ensure that they are used correctly in Chapter 4 and are consistent with the MARSSIM definitions.

2. Collaborate with S. Hay to consolidate Chapters 3 and 4.

3. Revise Chapters 3 and 4 and have them ready for review at the next MARSSIM Workgroup meeting (December 8-12, 2003).

C. Gogolak

1. Provide logo from the Department of Homeland Security to C. Petullo.

2. Provide R. Meck with input to help him direct Harry Chmelynski to proceed with refining his two papers in September.

3. Develop draft FAQs on (1) the percentage scan-to-release issue, (2) the relationship of the MDC to the MQC, and (3) when scanning isn't possible or scanning inefficiencies don't allow scanning to the DCGL. At the October 21 SAB meeting, establish a date for a conference call with the Workgroup to discuss them.

4. Provide bullet points on the FAQs for the presentation to the SAB on October 21.

5. Write the MDC appendix and use the MDC/MQC FAQ as a starting point.

6. Provide a copy of presentation given at the HPS meeting to R. Meck.

7. Develop the graded approach to recordkeeping within Chapter 5.

8. Address homeland security (Scenario B) and interdiction issues in the context of background radiation measurement variations and develop quantitative/statistical discussions for incorporation into Chapters 4 and 7.

9. Discuss the case of no logged data and incorporate discussions on the ANSI (E4) reference document in Chapter 7.

10. Expand on the discussion of MDCs, Scan MDCs, and MQCs and provide examples to clarify these issues in Chapter 7.

S. Hay

1. Update Chapter 3 based on Workgroup comments.

2. Incorporate two additional paragraphs in Sections 3.1 and 3.2, which were written by V. Lloyd, C. Gogolak, and R. Meck.

3. Transfer the current version of Chapter 3 and other relevant files to R. Coleman so that he can combine Chapters 3 and 4.

4. Revise Chapters 2 and 5 and have them ready for review at the next MARSSIM Workgroup meeting (December 8-12, 2003).

V. Lloyd

1. Review the September 22-26, 2003 draft meeting notes, insert comments in bold into the document, and distribute this edited version to the Workgroup for comments.

R. Meck

1. Based on input from C. Gogolak, direct Harry Chmelynski to proceed with refining his two papers in September.

2. Prepare a presentation for the Workgroup on the application of NUREG-1640 for the meeting.

3. Provide a paragraph summarizing the paper on small activity quantities and radionuclides with short half lives to be included in Section 3.5.4, prior to the December meeting.

C. Petullo

1. Email the Daubert factors paper to E. Boulos and L. Bender.

2. Ask the author of the Daubert factors paper to speak to the Workgroup.

3. Finalize the SAB presentation.

4. At the SAB meeting on October 21, set a date for a conference call to discuss C. Gogolak's draft FAQs.

5. Review the use of the term "investigation level" in MARSSIM to see if it is consistent with R. Coleman's definition and use of this term in Chapter 4 of MARSAME.

6. E-mail agendas to the Workgroup for the October and December 2003 meetings.

7. Check with D. Caputo to determine whether funding is available for S. Hay to complete his chapters.

A. Williams

1. Identify the nuclides associated with each of the scenarios to be presented to the SAB to facilitate the selection of example scenarios to combine.

2. Provide R. Meck with information and data on incineration.

3. Compile different survey design scenarios or "school problems" involving different facilities and radionuclides and e-mail them to C. Petullo for discussion at the October and December 2003 MARSSIM Workgroup meetings.

4. In conjunction with E. Boulos, determine whether funding is available for R. Coleman to complete his chapters.

Entire Workgroup

1. Provide C. Gogolak with input on factors that are important with regard to uncertainty for his discussion of MDC development.